How do Recent Machine Learning Advances Impact the Data Visualization Research Agenda?

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The Space of Machine Learning

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No “Political” Statement
Machine Learning is

- A scientific subject
- A useful technology for some algorithm/software development
- Potentially a powerful paradigm for simulating cognitive functions
- But most machine learning processes are NP-processes
Four Levels of Visualization

1. Disseminative Level
   - This is “a”!

2. Observational Level
   - “a”, “b”, “c”, … what, when, where?

3. Analytical Level
   - Are “a”, “b”, “c” related? Why?

4. Model-developmental Level
   - How does “a” lead to “b”?

Scientifically, ...

The Space of All Functions

- Quantum computing?
- Bio-computing?
- Cognition?
- Social computing?

Universal Turing Machine (with infinite tape length)
Scientifically, ...
Scientifically, ...
My Observations

- Algorithms: Some by humans, some by ML, some combined.

- Visually exploring the space of ML.
  - model space, template space, parameter space, data space, result space, and their relationships.

- Visually supporting software engineering with ML.
  - understanding, quality assurance, post-deployment monitoring.
Use ML in Visualization
to model and simulate
perceptual and cognitive functions
that we use during visualization
VIS2017 is a milestone for VIS+ML

- **Sunday**: Keynote 2, Keynote 3, VDS panel, best paper
- **Monday**: Vis+ML Tutorial, VADL 2017 workshop
- **Tuesday**: VAST best paper
- **Wednesday**: VAST Session ML1
- **Thursday**: VIS panel, VAST ML2, InfoVis Text+ML
- **Friday**: VAST ML3
Machine Learning and Visualization

Past

Present

Future